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REPRINT FROM THE

PROCEEDINGS 10.

OF THE

ROYAL SOCIETY OF EDINBURGH.

SESSION 1914-1915.

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VOL. XXXV.—PART I.—(No. 2.)

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The Baleen Whales of the South Atlantic.

By Principal Sir William Turner, K.C.B., F.R.S., D.C.L.



EDINBURGH :

PUBLISHED BY ROBERT GRANT & SON, 107 PRINCES STREET, AND  
WILLIAMS & NORGATE, 14 HENRIETTA STREET, COVENT GARDEN, LONDON

MDCCCCXIV.

Price Eightpence.





II.—The Baleen Whales of the South Atlantic. By Sir William Turner, Emeritus Professor of Anatomy, K.C.B., F.R.S., D.C.L.

(MS. received October 26, 1914. Read November 2, 1914.)

WHALING companies have for some years successfully conducted a whale fishery off the shores of the South Shetlands, Graham Land, South Orkneys, and South Georgia, where the waters of the Antarctic mingle with the South Atlantic Ocean.

A year ago Mr G. Millen Coughtrey, a former student of the University, an employé of the New Whaling Company of Leith, Messrs Salvesen & Co., kindly presented to me specimens from this southern latitude, which have been of value and interest in extending our knowledge of the Cetacea frequenting these seas. In a memoir communicated to the Society in December of that year\* I described from these specimens the external Auditory Meatus and its plug of wax, also the Tympano-petrous bones in several species of Cetacea, which, when compared with the corresponding bones in the Anatomical Museum of the University, were identified as from the Blue Whale, *Balenoptera sibbaldi*, the Sye Whale, *Balenoptera borealis*, the common Rorqual, *Balenoptera musculus*, and the Humpbacked Whale, *Megaptera boops (longimana)*. It was clear, therefore, that these well-known Northern species were also denizens of the South Atlantic.†

In September of this year Mr Coughtrey added to the collection by kindly presenting specimens obtained from whales captured off the South Shetlands and Graham Land during the fishing season 1913–14, which have further extended our knowledge of the species of Cetacea that frequent the Southern Ocean. This collection, in addition to examples from *B. sibbaldi*, *B. borealis*, and *Megaptera boops*, contained a tympano-petrous bone of the South Atlantic Right Whale, also a tympanic bone and foetus

\* *Proc. Roy. Soc. Edin.*, vol. xxxiv. p. 10, Dec. 1, 1913.

† In a recently published memoir Mr Theodore E. Salvesen has described the Whale Fisheries of the Falkland Islands and Dependencies. He enumerates *Megaptera*, the three species of *Balenoptera* referred to in the text, and the Southern Right Whale, *Balana australis*, as the baleen whales captured by the whalers. He estimates that nearly 11,000 animals were killed during the season, November 1, 1912, to April 30, 1913. He gives the approximate value of the whalebone and oil from each species respectively, that of the fresh flesh as food, and of the whale guano as a manure. The gross value of these products was about £1,350,000. See *Report on Scientific Results of Scottish National Antarctic Expedition*, vol. xix., May 12, 1914.

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of a Balænoptera, which I have identified as similar in character to  
*B. rostrata* of the North Atlantic.

#### BALÆNOPTERA ROSTRATA.

This species, known to fishermen as the Lesser Piked Rorqual, is the smallest and most frequent of the baleen whales stranded on the coast of Scotland.\* It has not been, I believe up to now, recognised by zoologists as a species frequenting the South Atlantic. Mr Coughtrey, however, informed me that the whaling seamen engaged in the South Shetlands and Graham Land fishing are acquainted with a small baleen whale called by them *Minka*, which contrasted strongly in its dimensions with the Blue Whale, Sye Whale and Humpbaek. Its relatively small size, the thinness of its coat of blubber, and the short whalebone made it of so little commercial value that it was seldom captured. During the last whaling season one was shot, and a right adult tympanic bone, along with a well-grown fœtus, was preserved by Mr Coughtrey. From the study of these specimens I regard this cetacean as the species *Balænoptera rostrata*.

#### *Tympanic Bone.*

The small size of this bone in *rostrata* at once distinguished it from the large tympanies of the other Balænopteriðæ. I have carefully compared the South Atlantic specimen with the tympanies of this species from the North Atlantic in the Anatomical Museum.

	Length.	Breadth.	Height.
<i>B. rostrata</i> —			
South Atlantic . . . . .	3·3 in., 85 mm.	2 in., 50 mm.	2·2 in., 56 mm.
Elie, Firth of Forth . . . .	87 "	45 "	55 "
" " " " . . . . .	87 "	46 "	56 "
Burntisland, " " " " . .	85 "	44 "	56 "
Alloa " " (young) . . . .	81 "	...	...

The South Atlantic specimen closely corresponded in dimensions to the tympanic bones of *rostrata* captured in the Firth of Forth, the somewhat greater breadth being due to the outer surface being a little more convex in the Southern specimen than in those from the North Atlantic. The configuration of the outer and inner surfaces of the tympanic, the appearance of the shallow inferior keel, the sharp ridge of the anterior border, the blunt posterior border, the sinuous character of the upper border

\* See my memoir on the Lesser Rorqual in *Proc. Roy. Soc. Edin.*, vol. xix., 1892, in which several specimens are described.

from which the lip-like process projected, the great tympanic cleft with its comparatively shallow Eustachian notch, proclaimed the South Atlantic



FIG. 1.—Outer Surface of Left Tympanic, *Balænoptera rostrata*, from Elie, Firth of Forth. Reduced in size. A, anterior, P, posterior border.

specimen to be identical with that of the well-known Lesser Piked *Balænoptera* which frequents the Scottish seas.



FIG. 2.—Outer Surface of Right Tympanic from South Atlantic. Natural size. A, anterior, P, posterior border; L, lip-like process.

It will be noted that in all the specimens measured in the Table the height of the tympanic, taken from the keel below to the superior border immediately in front of the lip-like process, was distinctly greater than



the greatest breadth, a character which I have elsewhere noted as to be recognised in *B. rostrata*.\*

*Fœtus.*

Mr Coughtrey had fortunately secured the fœtus of a Minka Whale which he had removed from the mother, shot during the late whaling season. The length of the latter was not measured, though it had possibly been about 16 feet.† The fœtus was preserved in spirit and soldcred up in a tin. It arrived in good order, and the cuticle was almost intact.

From its length along the curve of the back, 64 cm. (2 ft. 1 in.), in relation to the size of the mother it was evidently well grown. The maximum girth was at the head, behind which the body diminished in girth to the constricted region in front of the tail. The principal dimensions are given in the Table:—

DIMENSIONS OF FŒTUS.		
	Inches.	Centimetres.
From tip of beak along dorsal curve to mid notch of tail	25	64
„ same to axilla . . . . .	7	18
„ „ to eyeball . . . . .	4	10
„ „ to front of blowholes . . . . .	2.9	7.5
„ „ to angle of mouth . . . . .	4.3	11
„ „ to anterior border of dorsal fin . . . . .	17.3	44
„ „ to flange of tail . . . . .	22.8	58
„ „ to attachment of pectoral limb . . . . .	7	18
„ tip of mandible to umbilicus . . . . .	11.8	30
„ umbilicus to genital orifice . . . . .	3.5	9.2
„ „ to anus . . . . .	4.3	11
Girth around summit of head . . . . .	13.7	35
„ in front of pectoral limb . . . . .	12.8	32.5
„ at umbilicus . . . . .	11.4	29
„ in front of dorsal fin . . . . .	8.2	21
„ at root of tail . . . . .	2.7	7

The summit of the Head had a low boss-like prominence, in front of which the dorsum sloped downwards and forwards to the tip of the beak, also outwards to each lateral border, which formed a straight line from the base of the beak to its pointed tip. Immediately in front of the prominence, but on a lower plane, two narrow slit-like Blowholes, 1.5 cm. long, were situated; they were separated by a shallow median furrow and converged at their anterior ends, but did not communicate with each other. On the dorsum of the Beak a distinct median ridge was present which subsided near the tip. On each side of the ridge the surface was flattened and directed outwards to the straight lateral border of the beak. In

\* *Marine Mammals in the Anatomical Museum, University of Edinburgh*, p. 18, 1912.

† Well-grown specimens of *B. rostrata* from 13½ feet and upwards have been recorded. I described an adult female 28 feet 4 inches, the articulated skeleton of which is in the Anatomical Museum of the University. See *Proc. Roy. Soc. Edin.*, vol. xix., 1892.

general form the outline of the beak was triangular; the base was 8.5 cm. broad when measured in a straight line, but 11 cm. across the median ridge on the dorsum; the apex was vertically flattened. Over a dozen short, delicate Hairs formed a scanty beard at the tip of the lower jaw; a few scattered hairs were seen at the margins of the beak, also immediately below the lower lip and on each side of the anterior nares.\*

The Dorsal Fin projected from the mid-line of the back vertically above the genital opening. It was only 2 cm. ( $\frac{3}{4}$  in.) high, and its base of attachment was 3.7 cm. Its shape was falciform, the colour grey on the surfaces, black on the convex anterior border.



FIG. 3.—Profile of Head with Pectoral Fin of Fœtus of *Balenoptera rostrata*. Reduced.

The Tail was horizontal. Its posterior border was divided by a mesial notch into two symmetrical lobes, each of which had a thickened anterior border and a sharp posterior border, and ended in a somewhat pointed tip: the breadth between the opposite tips was 15.5 cm. (6 in.).

The Ventral aspect was for the most part either convex or flattened: but from the anus to the tail the sides were laterally compressed, and a mesial ridge was produced both ventrally and dorsally. The skin of the ventral surface of the mouth, throat, and as far back as the pectoral limbs presented numerous shallow furrows and ridges placed antero-posteriorly; they were the rudimentary representatives of the remarkable tegumentary folds which form so striking a character in the Rorquals.

\* Arnold Japha has figured (Spengel's *Zoolog. Jahrb.*, xxxii., 1911) hairs on the chin, lower jaw and upper jaw of fœtus of *B. rostrata*. W. B. Benham had previously described about 30 hairs on the chin and jaws of a young *B. rostrata* (*Trans. New Zealand Inst.*, 1901).

The Navel string had been torn across at the umbilicus and a few coils of intestine protruded through the aperture in the wall. The Genital opening was an antero-posterior slit, 5 mm. long. The Anal orifice, about 2 cm. behind the genital opening, was nearly circular, and admitted only a small probe.

The Orbit was situated immediately above the angle of the mouth. The eyelids were thin folds, and as the palpebral fissure, directed antero-posteriorly, was narrow, only a small part of the eyeball was visible. The orifice of the Auditory Meatus was not seen, but a shallow pit, 15 mm. behind the palpebral fissure, might indicate its position, though it would not admit a hair bristle.

The Buccal opening was 12 cm. (4·7 in.) long and 8 cm. (3·1 in.) wide at the angles. Narrow rudimentary folds represented the upper and lower lips. The Palate formed an elongated triangle; it was grooved mesially and the mucous membrane at the sides of the groove was thick and somewhat succulent. The Baleen plates had not as yet formed, and except faint transverse markings on the surface of the mucous membrane immediately behind the anterior end of the palate, no indications of the transverse folds of membrane, in connection with which the baleen plates are developed, could be seen.

The Tongue was well formed and had a distinct dorsal median furrow, which widened into a fossa near the tip. It was movable within the mouth, for 2·5 cm. at the anterior end; the circumference of this part was surrounded by mucous membrane, which formed a shallow frænum continuous with the membranous covering of the floor of the mouth. The sides of the tongue were also free, and at the part where the mucous covering was reflected on to the floor a well-marked raised band was present. The mucous lining of the floor of the mouth and of the sides of the tongue was grey, that of the dorsum linguæ was greyish black and with distinct papillæ.

The Bucco-pharyngeal opening scarcely admitted the tip of the little finger.

The Pectoral limb was narrow and short in relation to the size of the foetus, its length was 9 cm. (3·5 in.), the greatest breadth 2·8 cm. (1 in.), the surfaces were flattened; the posterior border was faintly convex, the anterior slightly concavo-convex, but in the outer third of the limb they approximated so that the tip assumed a lance-shaped form.

*Colour.*—As the cuticle was in place on the head and on a large part of the body, the natural colour of the foetus had doubtless been preserved. The prominence on the summit of the head and the dorsum of the body were black. At one spot the cuticle was loose and could be raised from the



cutis, when its deep surface showed the rich black rete Malpighi, which contrasted with the pink cutis. The dorsal fin and the dorsal mesial ridge were greyish black, but the dorsum of the tail was quite black. The dorsum of the beak was dark grey, which was modified to light grey at the border of the beak, the upper lip and around the orbit.

On the sides of the body the cuticle was translucent and colourless, and the vascular cutis subjacent to it modified the tint of the skin to a greyish pink. The larger part of the ventral aspect had a similar colour, but the lower lips and the skin covering the mandible were greyish like the upper lips. The sides and ventral ridge of the compressed body in front of the tail were greyish and the cuticle was not pigmented. The ventral surface of the tail was greyish pink.

The dorsum of the pectoral limb was grey interspersed with black streaks and spots. A greyish white band marked the anterior border and part of the dorsum, where it joined the side of the body. The ventral surface of the limb was grey.

The characteristic furrows on the ventral surface, though shallow, proclaimed the foetus to be a Rorqual of the genus *Balænoptera*. The form and relative size of the pectoral limb, the position of the dorsal fin vertically above the genital opening, the triangular beak with its straight lateral borders are characters present in *Balænoptera rostrata*. The boss-like prominence on the summit of the head of the foetus, which Mr Coughtrey had also noticed in the parent animal, is a character which has been figured in the North Atlantic *B. rostrata* and strengthens the identification of the species.\* The tympanic bone from the adult was without question that of *rostrata*. The testimony of these specimens established, therefore, this species as frequenting the South Atlantic.

The collection included several triangular plates of Whalebone, which varied in length from 11 to  $7\frac{1}{2}$  inches, and in greatest breadth from 5 to  $2\frac{1}{2}$  inches. The colour pattern was uniform: the outer half was black, inclining to dark grey near the middle of the plate: the inner half was white with a slight yellow tint. The bristly hairs from the inner edge were white and delicate in texture. If this whalebone had belonged to the Minka Whale, it differed in colour from the balcen of the Northern *B. rostrata*, which is uniformly white or yellowish white. On the other hand, it approximated to the balcen of the Syc Whale, *B. borealis*, which is

\* In the presence of a low boss-like prominence on the top of the head, in the position of the dorsal fin, and in the form of the pectoral limb the foetus closely corresponds with the figure of a *B. rostrata* 15 ft. 4 in. long, in F. W. True's great memoir on the Whalebone Whales of the North Atlantic, *Smithsonian Contributions*, Washington, 1904.

black with white or grey stripes in its inner part, so that I am disposed to regard it as belonging to the Sye Whale.

#### BALÆNA AUSTRALIS.

A tympano-petrous bone of the Southern Right Whale, *B. australis*, was obtained by Mr Coughtrey from a specimen shot in the Schollert Channel, Belgic Strait, Graham Land, in March 1914. The animal was a female, with blades of whalebone 7 feet long.

I have measured the tympanic bones and append a Table in which the dimensions are given, along with those of other specimens of *B. australis*; also those of the Right Whale of the North Atlantic, *Balæna biscayensis*. These bones are in the Anatomical Museum of the University.

DIMENSIONS OF TYMPANIC BONES.

	Length.	Breadth.	Height.
<i>Balæna australis</i> —			
Belgic Strait, Graham Land, 1914	4·7 in., 120 mm.	3·1 in., 81 mm.	4 in., 104 mm.
Te Awite, New Zealand . . .	126 "	75 "	105 "
" " " " " " " " " " " "	124 "	73 "	109 "
<i>Balæna biscayensis</i> —			
St Kilda, 1910 . . . . .	127 "	90 "	113 "
Tarbert, Harris, 1912 . . . . .	129 "	88 "	112 "
" " " " " " " " " " " "	128 "	93 "	113 "

In my memoir on the Right Whale of the North Atlantic, *Balæna biscayensis*,\* I discussed the question of the relation between *B. biscayensis* and *B. australis*, and came to the conclusion that there was no structural reason why the Right Whale of the North and South Atlantic should not be regarded as the same species, for difference in habitat did not necessarily imply specific difference.

From a comparison of the measurements of the tympanic bones in the Table it will be seen that whilst the specimens from the Right Whale of the North Atlantic were a little larger than those from the Right Whale of the South Atlantic, probably derived from older animals, the length, breadth, and height corresponded in their relative proportions; the height in each case also much exceeded the breadth, owing to the strong keel on the inferior aspect of the bone. They corresponded also in their general configuration. In each bone the outer surface in its upper part had two definite convexities separated by a wide, deep, oblique groove, whilst the

\* *Trans. Roy. Soc. Edin.*, vol. xlviii. p. 889, 1913, and *Marine Mammals in Anatomical Museum of University*, 1912.

lower part formed a broad, shallow, concave surface which sloped downwards to the strong keel. The upper border of the outer surface formed the sinuous outer edge of the tympanic cleft and a strong lip-like malleal process, *l*, projected from this border. The inner surface was roughened

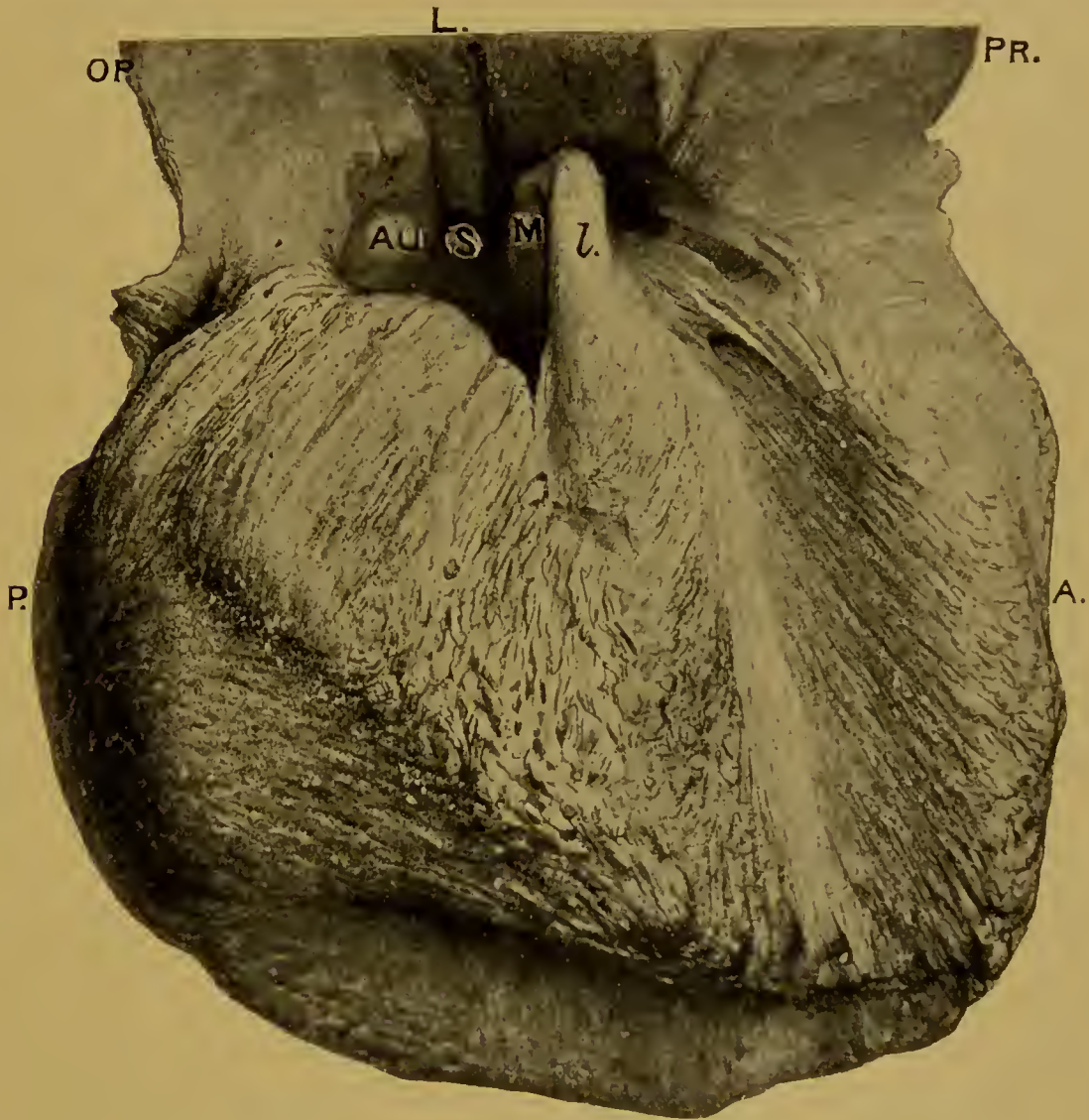


FIG. 4.—Right Tympano-petrous, *Balena australis*. Natural size.

A, anterior, P, posterior border of tympanic; *l*, lip-like process for malleal attachment; L, labyrinthine, PR, pre-otie, OP, opisthotic divisions of petrous at their junction with the peduncles; M, head of malleus; S, stapes; Au, opening into tympanic cavity closed in living head at deep end of auditory meatus by membrana tympani.

in proximity to the keel, but immediately below its upper border it was moderately convex and striated, where it formed the inner edge of the tympanic cleft, which was relatively thin as it turned into the tympanic cavity. This border was mostly horizontal, but anteriorly it formed a deep Eustachian notch.



In the specimen from Belgic Strait the tympanic ossicles, malleus and stapes had been preserved, and the malleus was fused by a pair of processes parallel to each other with the lip-like process on the sinuous border of the tympanic cleft.

The Petrous bone consisted of the Labyrinthine, Pre-otic and Opisthotic parts. The Labyrinthine was locked between the pre-otic and opisthotic divisions. Its upper surface was rough for articulation with the basis cranii; the under surface showed a smooth convexity directed to the tympanic bulla and cleft; it formed the inner wall of the tympanic cavity, in which was a deep fossa ovalis, with the stapes attached to the fenestra ovalis. The inner end of the labyrinthine projected to the cranial cavity and contained large canals and foramina for the passage of the divisions of the auditory nerve and blood-vessels.

The Pre-otic was a rough mass of bone 17·3 cm. (7 in.) in its longest diameter; the outer end tapered to a point, the inner end was blunted. The Opisthotic was a flattened plate 18 cm. in length, and 12 cm. (4·7 in.) broad at its labyrinthine attachment, whilst it narrowed posteriorly to a pointed process. These divisions were fused by peduncles to the tympanic bone: the anterior peduncle connected the pre-otic to the sinuous border of the tympanic cleft in front of the lip-like process; the posterior peduncle connected the opisthotic to the posterior end of this border, and was separated from the lip-like process by a gap, which corresponded with the deep end of the external auditory meatus and the membrana tympani in the living animal. The pre-otic and opisthotic had strong articulations with the basis cranii. Their general form and relations corresponded in the three specimens of *B. australis*, though the opisthotic in those from New Zealand was more massive, but not so wide as that from Graham Land. The opisthotic in *Balæna*, when removed in its entirety from the skull, was much shorter than in the larger species of *Balænoptera*, in which I have seen it to attain a length of 43 cm. (17 in.) and to be of the almost uniform breadth of 13 cm. in the greater part of its length.\*

The specimens in the Anatomical Museum, as well as those recently presented by Mr Millen Coughtrey, warrant the statement that the following species of Baleen Whales are to be found in the South Atlantic:—The *Balænopteridæ*—*Megaptera boops (longimana)*, *Balænoptera sibbaldi*, *borealis*, *rostrata*, also *B. musculus*.

The Right Whale, *Balæna australis*, has been associated with the South Atlantic since its recognition by Desmoulins in 1822.

\* See my memoir on the Auditory Organ in the Cetacea, and compare *B. australis* with the petrous bone in *Balænoptera*, *Proc. Roy. Soc. Edin.*, vol. xxxiv. p. 10, 1913.



The comparison of the tympano-petrous bones from the Balænopteridæ in the South Atlantic with those from animals captured in the North Atlantic warrants the statement, that differences do not exist between them which can be regarded as specific, notwithstanding that their habitats are so widely separated.

Similarly, the smaller Right Whale, *Balæna australis*, which frequents the temperate waters of the South Atlantic, so closely resembles the corresponding Right Whale, *Balæna biscayensis*, of the North Atlantic, that they are obviously the same species.\* On the other hand, the larger Greenland Right Whale of the Arctic Ocean, *Balæna mysticetus*, so far as we at present know, has no representative in the Antarctic.

\* See my memoir on *Balæna biscayensis* in *Trans. Roy. Soc. Edin.*, vol. xlviii., 1913.

(Issued separately December 4, 1914.)

